Quiz

Name:________________________

Knowns:

v = 14.59 m/s

t = 2.97 s

$$v = {}^{d}/_{t}$$

$$d = v \times t$$

$$d = 14.59\frac{m}{s} \times 2.97\ s$$

$$d = 43.33\ m$$

1. Calculate the distance of the ball in the horizontal direction if it was launched at a velocity of 14.6 m/s in the x axis and it was in flight for 2.97 s.

Knowns:

F = 2269 N

a = 302.53 m/s^2

$$F = ma$$

$$m = \frac{F}{a}$$

$$m = \frac{2269\ N}{302.53\ m/s^2}$$

$$m = 7.5\ kg$$

If you knew that to hit only the top four boxes off of the free play boxes simulator the acceleration needed was 302.53 m/s2 and the spring force vector needed was 2269 N, what would the mass of the ball need to be?

Knowns:

V_i = 20 m/s

Θ = 60°

$$v_{ix} = v_i \cos\theta$$

$$v_{ix} = 20 \cos 60$$

$$v_{ix} = 10\ m/s$$

$$v_{iy} = v_i \sin\theta$$

$$v_{iy} = 20 \sin 60$$

$$v_{iy} = 17.3\ m/s$$

If the cannonball has a launch angle of 60° and an initial velocity of 20.0 m/s, calculate the horizontal and vertical components of the velocity vector.

Bonus: Set the mass of the cannonball to 10 kg and the spring force slider to 5000 N. Use the different steps of the lessons to help you answers the following questions.

a) Notice how in lesson 1 the resultant force vector before the ball is released is not parallel to the spring force vector, why is this?

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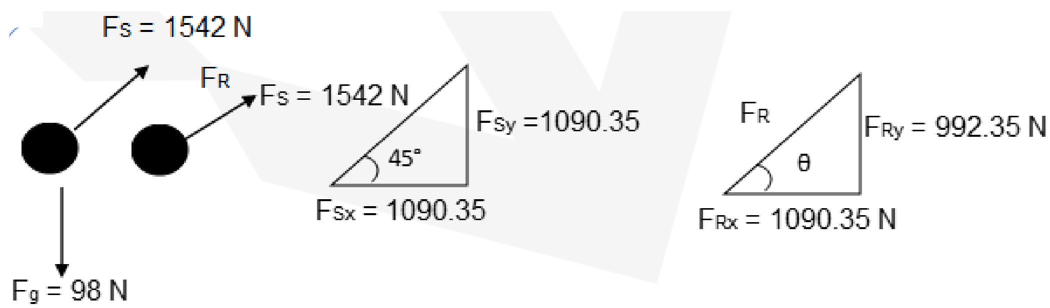
b) If the spring force vector is angled at 45° above the horizontal, calculate the actual angle of release of the cannonball along the trajectory of the resultant force.



$$F_{Sx} = F_S \cos(45)$$

$$F_{Sx} = 1542 \times \cos(45) = 1090.36\ N$$

$$F_{Sy} = F_S \sin(45)$$

$$F_{Sy} = 1542 \times \sin(45) = 1090.36\ N$$

$$F_{Ry} = F_{Sy} - F_g$$

$$F_{Ry} = 1090.36\ N - 98\ N = 992.36$$

$$\theta = \tan^{-1}\left(\frac{F_{Ry}}{F_{Rx}}\right)$$

$$\theta = \tan^{-1}\left(\frac{992.36\ N}{1090.35\ N}\right) = 42.31°$$

Check:

$$F_R = \sqrt{(F_{Rx})^2 + (F_{Ry})^2}$$

$$F_R = \sqrt{1090.36^2 + 992.36^2} = 1474.5\ N$$

Hint: You can check your work by ensuring that your final resultant force is the same as what's shown in the unity simulation